



# Spreadable Virus of the 21<sup>st</sup> Century: COVID-19

Chaudhary Priya and Janmeda Pracheta ✉

Received: 21.03.2020

Revised: 01.04.2020

Accepted: 15.04.2020

## Abstract

The latest outbreak of a respiratory disease, known as coronavirus disease 19 (COVID-19), is the third virus spillover from animals to humans in the last two decades. The disease is caused by coronavirus and has converted into an epidemic in recent days. It spread via direct contact or droplets of nasal-discharge from one human-to-another within the mean-incubation period of 6.5 days. Dyspnea, cough and fever are the most common symptoms in the patients of COVID-19, though along with diarrhea in 3% cases. Bilateral pulmonary with ground-glass opacity and consolidation has been observed in 98% cases of the disease by the help of computed tomography. The treatment process of COVID-19 with chloroquine and remdesivir drug is under the clinical trial worldwide and responding well to cure the disease. Under the prevalent circumstances, the main goal is to control the widespread infection of SARS-CoV-2 across the world and to aware the public regarding the possible preventive measures and treatments. However, the public health authorities should keep a close eye on the circumstances strictly, as the more we know about this novel coronavirus and its outbreak, the better we can respond or control the conditions worldwide.

**Keywords:** COVID-19; Disease; Pandemic; SARS-CoV-2; Symptoms; Treatments; Virus.

## Introduction

On December 27, 2019, three patients with severe pneumonia were admitted to a hospital in Wuhan, China; a 61-year-old man, a 32-year-old man, and a 49-year-old woman. The woman was the retailer in a wholesale market of seafood, while the older man was one of the visitors. Similar situations and patients had been reported at the time of the SARS-CoV outbreak, this led to the suspicions of a novel virus, which was further tested as etiologic agent identified in all the 3 samples of the patient (Zhu, 2020). These RNA viruses have a better mutation mechanism that makes them adapt to diverse hosts, raising their capability for immediate human-to-human transmission once a spillover event has taken place. The novel coronavirus is the seventh recognized human coronavirus, and seems to have a notable resemblance to another two highly pathogenic human respiratory coronaviruses, Middle East respiratory syndrome coronavirus (MERS-CoV) and severe acute respiratory syndrome coronavirus (SARS-CoV) as reported by Fehr and Perlman, 2015. The MERS-CoV, SARS-CoV, and COVID-19 are related to the family of beta coronaviruses.

These beta coronaviruses generally give rise to gastroenteritis and respiratory symptoms in animal and human hosts whereas the other remaining human coronaviruses (OC43, NL63, HKU1 and HCoV-229E) are restricted in their disease severity and often fail to develop symptoms greater than the common cold in the immune-compromised individuals (Cui, 2018). As reported by Lai, 2020, regarding the number of cases of COVID-19, a decreasing rate was reported in China, but a hiking rate was occurring outside the China. This review aims to provide information regarding the COVID-19 along with the protective measures that should be taken by every citizens of the country wholeheartedly to prevent its further spread.

## Material and Methods

The review is restricted to research papers, review articles and different websites ([www.uptodate.com/content/coronavirus-disease-2019-covid-19/](http://www.uptodate.com/content/coronavirus-disease-2019-covid-19/) and [www.worldometers.info/coronavirus/](http://www.worldometers.info/coronavirus/) etc.). Keywords used for search included: COVID-19, viruses, treatments, coronavirus, and mechanism of COVID-19 etc. Results of the database search were reviewed to identify relevant articles.

## Author's Address

Department of Bioscience and Biotechnology, Banasthali  
Vidyapith, Rajasthan-304022, India  
**E-mail:** [pracheta.25@gmail.com](mailto:pracheta.25@gmail.com)



## Results and Discussion

More than 50 articles about coronavirus were identified using the search method described above. A summary of the findings of these studies is represented below.

### Coronavirus virology

Chen, 2020 reported that coronaviruses related to the Coronavirinae subfamily in the Coronaviridae family of the Nidovirales order, and this includes four different genera: Delta coronavirus, Gamma coronavirus, Beta coronavirus and Alpha coronavirus and he also reported that the corona viruses have the single-stranded positive-sense RNA genome of ~30kb with cap on 5'-end and tail on 3'-end.

Based on the sequencing and phylogenetic report, COVID-19 belongs to similar subgenus but of variable clade as of SARS-CoV (<https://www.uptodate.com/content/coronavirus-disease-2019-covid-19>). The spikes of club-shape projecting from the surface of virion is the most important feature of coronaviruses. These spikes are a characteristic property of the virion and give rise the appearance of solar corona, supporting the name coronavirus (Fehr and Perlman, 2015).

### Spread of virus

The virus may be spread from person-to-person contact through the droplets of the infected individual that can transfer in the nose, mouths, and conjunctiva of an eye of the non-infected individuals which further reaches to the lungs and there is a possibility that an individual can get infected from COVID-19 by touching an object or surface that already has the virus on it. The COVID-19 can spread sustainably and easily into the community, means peoples have no idea how they became infected in an area which is known as "community spread" (<https://www.cdc.gov/coronavirus/2019-ncov/about/transmission.html>).

### Countries at higher risk

Novel coronaviruses spreading to more than 212 countries and some territories (China, Italy, Iran, South Korea, Spain, Germany, France, USA, Switzerland, UK, Norway, Netherlands, Sweden, Belgium, Denmark, Austria, Japan, Malaysia, Qatar, Canada, Greece, Australia, Czechia, Portugal, Finland, Singapore, Slovenia, Bahrain, Israel, Brazil, Iceland and many more) worldwide and 1 Cruise ship (Diamond Princess) which is hold

on in Yokohama, Japan as shown in figure 1 and figure 2

(<https://www.worldometers.info/coronavirus/>).

### Mechanism of COVID-19 infection

The S protein of the coronaviruses helps them to get enter inside the host cell by the help of some cellular receptors such as C-type lectin (CD209L) for SARS-CoV, Dipeptidyl peptidase-4 (DPP4) for MERS-CoV and Angiotensin-converting enzyme 2 (ACE2) for SARS-CoV and COVID-19 by the endocytosis process. After entry, uncoating and release of viral nucleocapsid inside the cytoplasm. The genomic RNA (gRNA) translates to produce polyproteins (pp1a and pp1ab), which resulted in the formation of nonstructural proteins (nsps) that induce the emergence of double-membrane vesicles (DMVs), where anchoring of viral replication transcription complexes (RTCs) have been done. Replication of full-length genomic RNA (gRNA) occurred by the help of negative-sense intermediate, and the species of sub genomic RNA (sgRNA) are formed by transcription process of discontinuous type. These sgRNAs encode accessory and structural proteins. At last, germination of virus particle has been carried out inside the endoplasmic reticulum-Golgi intermediate compartment (ERGIC) and further on, virus releases out from the cell by the exocytosis process (Fung, 2019; Li, 2020b).

### Diagnosis

In order to prevents the widespread of COVID-19 among the community, proper diagnosis of the infected individuals need to be done so that they can be isolated or treated on time before they get start a chain reaction in the society by infecting more individuals or relatives.

### Clinical manifestation

The infected patients of COVID-19 reported with symptoms such as dyspnea, dry cough, fatigue, runny nose and fever etc.

### Physical examination

Patients in serious circumstances may showed certain physical symptoms decreased or increased tangible tremor of speech, dullness in percussion, weakened breath sound, moist rales in lungs and shortness of breath etc.

### CT imaging

According to Jin, 2020, the CT imaging of patients differ with drug intervention, underlying disease,



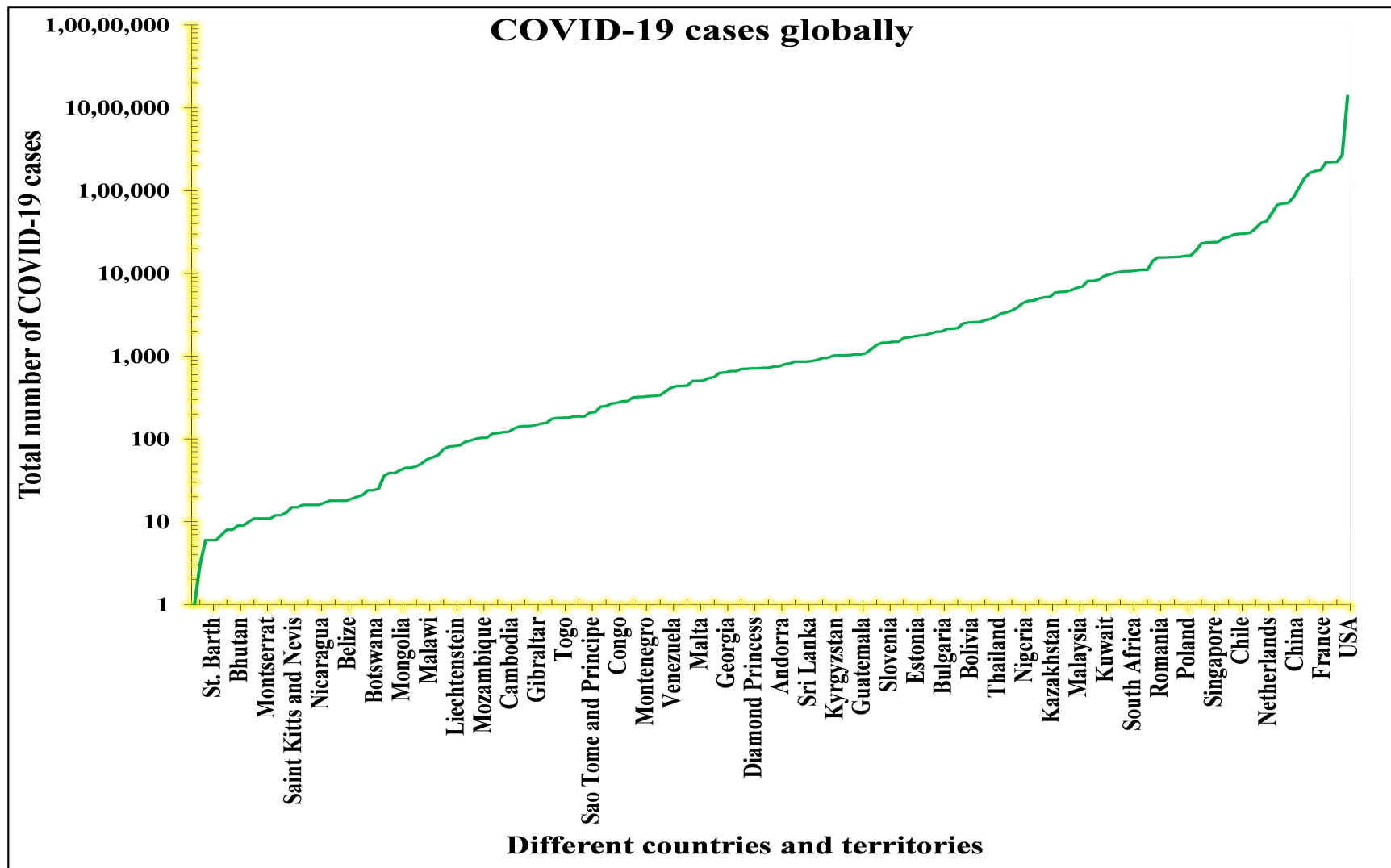
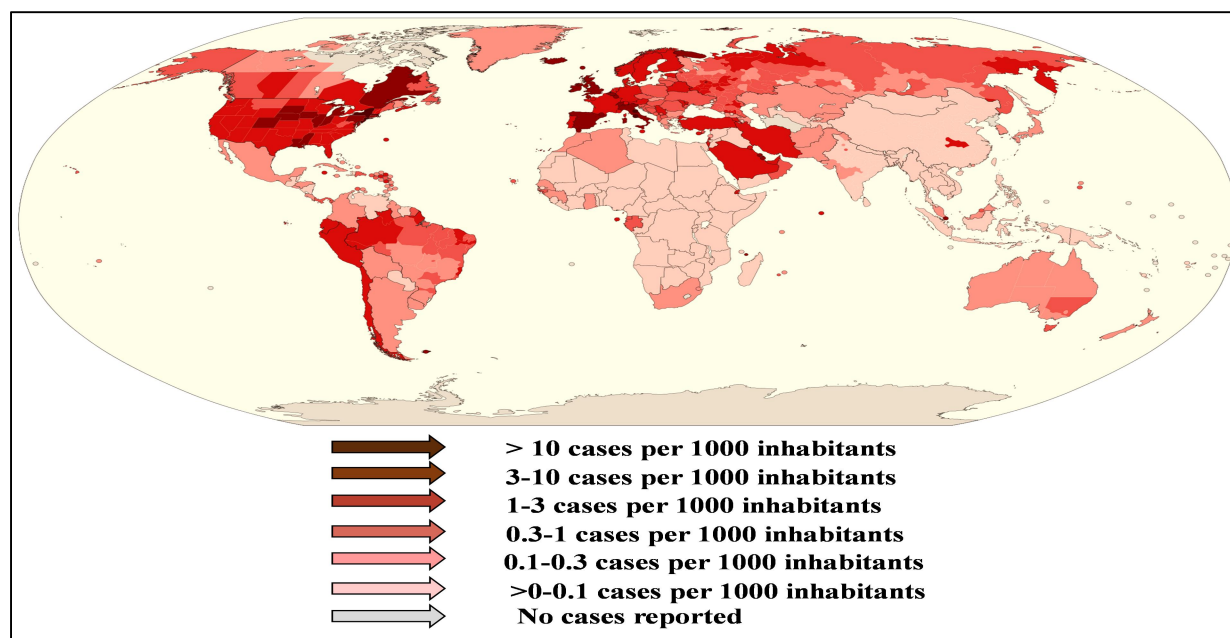


Figure1: Graph representing number of COVID-19 confirmed cases in different countries and territories.



**Figure2: Map showing COVID-19 cases.**

stage of disease, status of immunity and age which includes (1) dominant distribution (mainly sub-pleural, along the bronchial vascular bundles); (2) quantity (one or more than one lesion); (3) shape (cord-like, grid-like, lumpy, nodular, large block and patchy); (4) density (uneven) and; (5) varied concomitant signs (enlargement of mediastinal lymph node, an effusion of rare pleural and air-bronchogram), etc.

The radiological findings are quite different for COVID-19 pneumonia cases. About 75% of individuals are reported with bilateral lung involvement and 71% with the multilobe involvement. In about 86% of cases, ground-glass opacity (GGO) was identified in the chest computed tomography (CT) and 29% represented consolidation (Lai, 2020).

#### ***Evaluation of Hematological parameters***

The greater focus should be given on the condition where the count of lymphocyte is lower than  $0.8 \times 10^9/L$ , or the numbers of CD8 T and CD4 cells are declined as reported in case of novel coronavirus, which should be rechecked again after 3 days.

#### ***Detection of COVID-19 nucleic acid***

The detection of 2019-nCoV comes positive in the other respiratory tract samples or throat swab

samples with the help of fluorescence quantitative PCR method in comparison to that from other diagnosis kits and multiple samples, excluding technical problem, contamination chances, quality of sample and collection time of the sample, is of great contribution for the accurate diagnosis (Jin, 2020).

#### **Possible treatments available**

No specific treatment and vaccine are recently present, however various COVID-19 specific protective treatment and vaccines are in the stage of progress and trials but certain possible therapies are available for COVID-19 which are mention below:

#### ***Allopathic treatment***

Various drugs, including lianhuaqingwen or shufengjiedu, lamivudine and tenofovir disoproxil, arbidolR, neuraminidase inhibitors, lopinavir/ritonavir, nucleoside analogs, remdesivir, a novel vinyl sulfone protease inhibitor, 3CLpro inhibitor (3CLpro-1) and an angiotensin-converting enzyme 2 (ACE2)-based peptide appears to showcase their antiviral potential against novel coronavirus and drugs like chloroquine and remdesivir were found to be effective against COVID-19 and at the clinical trials further in a different part of the world in order to find out the specific cure of this virus (Dong, 2020; Lai, 2020).

### ***Yoga treatment***

Stress, may lead to faster development and greater duplication of the virus in the infected patient by the immune-neuro-endocrine axis. It has been proved that yoga reduces the level of stress via reducing the sympathetic activity and produces a state of parasympathetic dominance (Bhargav, 2014). Yoga is a non-partial gift for the mankind that helps in the cure of several kinds of diseases of both mind and body which includes, “Bhastrika Pranayama” (This pranayama exempt lungs from unwanted microbes and air, enable the seepage of surplus mucous from nasal mucosa and sinus), “Anulom Vilom Pranayama” (This Pranayama withdraw congestion from the Nadis thus make certain the free pass of energy all over the body, boost up the immunity and overcome the disproportion of the autonomous nervous system) and “Kapalabhati” (This exercise cleanse out the blockages of the respiratory system, improves out the mental health, rejuvenates and refresh the region of head) as reported by Khajuria, 2019.

### ***Ayurvedic treatment***

Infections caused by viruses are difficult to deal with as they are not able to get treated by different antibiotics, and they use the host cells for their hiding and later on carrying out their replication inside them. Some antiviral drugs are available in the market but mostly they result in various side effects. Ayurveda remedies help to fight against the viral infection causing agent in a natural way by boosting the immune system of the body. (<https://allayurveda.com/blog/viral-infections-and-home-remedies/>). Some commonly used ayurvedic recipes are as follows:

1. Drink boiled water containing Shadanga Paniya Kwatha ayurvedic churna which is called “Shadanga Paniyam”.
2. Drink hot green tea prepared with water, ginger, honey, and lemon. As lemon is an anti-inflammatory agent rich in an antioxidant that provides high immunity to respiratory organs.
3. Try to consume fully boiled broccoli, cabbage, radishes, and beetroot salad as they detoxify your body.
4. Take herbal tea prepared with herbs such as vasa, peppermint, basil, and madhuyashti with 1-2 tablespoon of honey.
5. Add turmeric to your daily food and to milk at night to prevent infectious sore throat and cold.

6. Intake Kashayam prepared out from the mixture of turmeric, pepper, ginger, and tulsi in boiled water.
7. Intake Guduchi that can enhance your immune system and recover your fever.
8. Hot Milagu and Seeragam Rasam should be consumed daily (<https://www.liveright.in/blog/does-ayurveda-medicine-cures-coronavirus-infection/>)

### **Protective measures**

Presently no cure is available for COVID-19 so, the fore most course of action to hinder disease is to avoid being infected to this virus by following certain protective measures.

1. Repeatedly cleanse your hands with water and soap for about 20 seconds. If you are not able to wash your hand then sterilize them by the use of hand sanitizers.
2. Avoid touching your mouth, nose, and eyes with non-sanitized hands.
3. Avoid close touch with the infected peoples who are ill.
4. Wear a mask if you are visiting crowded places like bus, metros, railway stations, malls, and airports, etc. (U.S. Department of Labor, <https://www.osha.gov/SLTC/covid-19/>).
5. If you experienced a breathing problem, cough, cold, and fever then visit to doctor for the medical examination (<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>).
6. Avoid unnecessary exposure with wild and farm animals (Lai, 2020).
7. Wearing goggle is must for the health officials while questioning and examining the patients at the hospitals (Wang, 2020).
8. Self-quarantization is must for the peoples who have been travel from abroad or for those who have been came in contact with someone positive with COVID-19.

### **Conclusion**

We have discussed the methodology, virology, spreading, ability, diagnosis, available treatments and preventive measures taken against the novel coronavirus that is capable to induce severe respiratory disease in human beings. Outbreak of this disease highlights the concealed viruses present inside the wildlife and their capability to spill over



into the population of human and resulted into an epidemic.

## Acknowledgements

The authors acknowledge the Bioinformatics Center, Banasthali Vidyapith supported by DBT and DST for providing computation and networking support through the FIST and CURIE programs at the Department of Bioscience and Biotechnology, Banasthali Vidyapith, Rajasthan.

## References

- Bhargav, H., Raghuram, N., Rao, N.H.R., Tekur, P. and Koka, P.S., 2014. Potential yoga modules for the treatment of hematopoietic inhibition in HIV-1 infection. *Journal of Stem Cell*. 5: 129-148.
- Chen, Y., Liu, Q. and Guo, D., 2020. Emerging coronaviruses: Genome structure, replication, and pathogenesis. *Journal of Medical Virology*. 92: 418-423. <https://doi.org/10.1002/jmv.25681>.
- Cui, J., Li, F. and Zheng-Li, S., 2018. Origin and evolution of pathogenic coronaviruses. *Nature Review Microbiology*. 17: 181-192. <https://doi.org/10.1038/s41579-018-0118-9>.
- Dong, L., Hu, S. and Gao, J., 2020. Discovering drugs to treat coronavirus disease 2019 (COVID-19). *Drug Discoveries and Therapeutics*. 14: 58-60. <https://doi.org/10.5582/ddt.2020.01012>.
- Fehr, A.R. and Perlman, S., 2015. Coronaviruses: An overview of their replication and pathogenesis. *Methods in Molecular Biology*. 1282: 1-23. [https://doi.org/10.1007/978-1-4939-2438-7\\_1](https://doi.org/10.1007/978-1-4939-2438-7_1).
- Fung, T.S. and Liu, D.X., 2019. Human coronavirus: host-pathogen interaction. *Annual Review of Microbiology*. 73: 529-557. <https://doi.org/10.1146/annurev-micro-020518-115759>.
- <https://allayurveda.com/blog/viral-infections-and-home-remedies/>
- <https://www.cdc.gov/coronavirus/2019-ncov/about/transmission.html>
- <https://www.liverright.in/blog/does-ayurveda-medicine-cures-coronavirus-infection/>
- <https://www.osha.gov/SLTC/covid-19/>
- <https://www.uptodate.com/content/coronavirus-disease-2019-covid-19/>
- <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>
- Jin, Y.H., Cai, L., Cheng, Z.S., Cheng, H., Deng, T., Fan, Y.P., Fang, C., Huang, D., Huang, L.Q. et al., 2020. A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (Standard version). *Military Medical Research*. 7: 4. <https://doi.org/10.1186/s40779-020-0233-6>.
- Khajuria, R., Gupta, R., Parihar, V. and Sharma, T., 2019. Role of yoga, diet and home remedies on sinusitis. *International Journal of Ayurvedic Medical Journal*. 7: 548-551.
- Lai, C.C., Shih, T.P., Ko, W.C., Tang, H.J. and Hsueh, P.R., 2020. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. *International Journal of Antimicrobial Agents*. 105924. <https://doi.org/10.1016/j.ijantimicag.2020.105924>
- Li, X., Geng, M., Peng, Y., Meng, L. and Lu, S., 2020b. Molecular immune pathogenesis and diagnosis of COVID-19. *Journal of Pharmaceutical Analysis*. 10 (2):102-108. <https://doi.org/10.1016/j.jppha.2020.03.001>.
- Li, X., Zai, J., Wang, X. and Li, Y., 2020. Potential of large “first generation” human-to-human transmission of 2019-nCoV. *Journal of Medical Virology*. 92: 448-454. <https://doi.org/10.1002/jmv.25693>.
- Wang, W., Tang, J. and Wei, F., 2020. Updated understanding of the outbreak of 2019 novel coronavirus (2019-nCoV) in Wuhan, China. *Journal of Medical Virology*. 92: 441-447. <https://doi.org/10.1002/jmv.25689>.
- Zhu, N., Zhang, D., Wang, W., Li, X., Yang, B., Song, J., Zhao, X., Huang, B., Shi, W., Lu, R., Niu, P. and Zhan, F., 2020. A Novel coronavirus from patients with pneumonia in China, 2019. *The New England Journal of Medicine*. 382: 727-733. <https://doi.org/10.1056/NEJMoa2001017>.
- Figure References:**
- [https://en.wikipedia.org/wiki/2019%E2%80%9320\\_coronavirus\\_pandemic\\_by\\_country\\_and\\_territory](https://en.wikipedia.org/wiki/2019%E2%80%9320_coronavirus_pandemic_by_country_and_territory).
- <https://www.worldometers.info/coronavirus/>

